DOCUMENT RESUME

ED 397 838 IR 018 026

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TITLE A Conceptual Framework and Procedure for Message Design.
PUB DATE 96
NOTE 16p.; In: Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology (18th, Indianapolis, IN, 1996); see IR 017 960.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Design Preferences; Educational Theories; Focus Groups; Formative Evaluation; *Instructional Design; *Instructional Effectiveness; Instructional Material Evaluation; Learning Motivation; Perception; Simulation
IDENTIFIERS *Conceptual Frameworks; Design Research; Interactive Systems; *Message Design; Performance Support Systems; Process Improvement

ABSTRACT

Instructional message design must attract attention and result in learning by facilitating perception, comprehension, and retention. The purposes of this research are: (1) to develop a conceptual framework for message design; (2) to develop a systematic procedure for message design; and (3) to provide one basis for the development of a performance support system. Focus groups of advanced instructional design students explored message design procedures and relationships by investigating how to evaluate the thoroughness of the message design process, how to condense variables obtained from the initial evaluation to make a usable design aid, and developing a simulation exercise requiring application of the procedure to solve typical message design problems. Charts representing design aids are included for each of the framework's major variables: (1) learning types; (2) parameters of the message; (3) paradigms; (4) motivational principles; and (5) perceptional principles. Results of the evaluation indicate that it is an effective procedure for practitioners because it helps them be systematic and cues them to attend to variables in specific ways. (Contains 35 references.) (SWC)

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Title:

A Conceptual Framework and Procedure for Message Design

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Every day we are bombarded with messages. Our minds sift through the thousands of signals we receive and chooses which ones we pay attention to, which ones we remember for a short period of time, and which ones go into our long-term memory. Such message bombardment exists in the form of advertisements on a radio, posters on a bus, news on television, directions on a box of brownie mix, letters retrieved from e-mail, and a warning on an antihistamine package. The mind must sift well in order to weed out the many other messages we receive that are unimportant.

It is not surprising, therefore, that when a message is intended to be instructional, great care must go into planning for the content and form that will attract attention and facilitate perception, comprehension, and retention. An instructional designer or developer uses research and theory to produce a message that retains attention and results in learning. To do this, the designer or developer draws on theory from many fields including:

psychological and learning theories which provide principles related to outcomes
communication and systems theories which provide process models
aesthetic principles which provide guidelines for graphic design and cuing.

Since the 1950's, one journal has continuously published articles on message design. This journal is *Educational Technology Research and Theory* formerly *Educational Communications and Technology Journal* and *Audiovisual Communications Review*. Many books have addressed the topic including Berelson & Steiner, 1964; Fleming & Levie, 1978; 1993; West, Farmer, & Wolff, 1991; and Tufte, 1983;1990. The *Handbook of Research on Educational Communications and Technology* (Jonassen, in press) devotes several of its 42 chapters to principles related to the design of messages including chapters on:

Behaviorism and Instructional Technology
Cognitive Perspective in Psychology
Research on and Research with Emerging Technologies
Visual Literacy
Visual Message Design and Learning
Text Design
Multiple-Channel Communications
Instructional Technology and Attitude Change

One consequence of these multiple sources of research and theory is designers who are overwhelmed by an abundance of principles and guidelines because they do not have tools to facilitate taking many variables into account concurrently. Despite the voluminous research published and the numerous models, concepts, and theories hypothesized, there is little to help the designer understand and apply this work because conceptual frameworks which illuminate relationships among message design variables are inadequate.

Furthermore, the art of message design has been practiced with the tools of another age. Paper and pencil are fine tools, but their use is limited. Working in the field of instructional technology, one cannot avoid wondering when the technology will be applied to the field itself. Efforts have been made to automate design including message design. Richey (in press) reviews trends in research on automated design tools and the practicality of such tools. Powell and Okey (1994) discuss the role of performance support in multimedia authoring. Merrill and his colleagues have developed Instructional Transaction Theory which addresses instructional strategies as well as message design (Merrill & ID2 Research Team, April,1993; Merrill, Jones, & Li, June,1992). Issues of evaluating automated design have been raised by Gros and Spector (1994). Nevertheless, no commonly accepted automated procedure for message design has been produced.

Our goal was to develop a conceptual structure that would lead to an improved process for message design by making relationships among variables clearer; thus, theories from diverse sources would become more manageable. To develop this conceptual structure and process, many issues had to be resolved. The process was evaluated formatively as the structure was being developed.

The ideas presented here are seen as an initial step in developing an electronic performance support system (Witt & Wager, 1994; Gery, 1993; Stevens & Stevens, 1995) for designing messages. When combined with the work of others, such as the work of Keller and others on motivation (Keller & Burkman, 1993; McAleese & Gunn, 1994) and the work of Boling (1995; 1994) on screen design principles, this conceptual structure could become part of a computerized tool to

support message design. Even if that progression does not occur, results from formative evaluations substantiate the value of the conceptual structure as a base for procedural theory which disciplines and guides designers. The purposes of this research are (1) to develop a conceptual framework for message design, (2) to develop a systematic procedure for message design, and (3) to provide one basis for the development of a performance support system.

The Theoretical Base for Message Design

Since the 1960's researchers in instructional technology have pursued the goal of a theoretical base for message design. This goal has been elusive despite (a) the synthesis of research into principles, (b) the extension of principles in areas such as motivation and concept learning, and © the increasing availability of tools for the design of messages and researching message design. In 1962 an issue of *Audiovisual Communication Review* was devoted to the relationship of perception theory to the design of audiovisual messages (Norberg, 1962). As early as 1963 a definition of the field described instructional technology as the study and practice of controlling messages (Seels & Richey, 1994). All of the articles in the July-August 1963 issue of *Audiovisual Communications Review* addressed message design because the issue included articles on the use of pictures, repetition in educational television, opinion change as mediated by film, effectiveness of films with indirect presentations, and pacing in programed instruction.

Berelson and Steiner (1964) culled principles from psychology that could help the behavioral scientists in a variety of roles. Fleming and Levie (1978) extended the work of Berelson and Steiner but directed their book towards instructional planners, such as message designers. Fleming and Levie's first edition had a great impact on the field as documented by the number of reviews (Markle, 1979; Borich, 1979; Clark; 1979) that appeared at that time and the awards presented to the authors by the Association for Educational Communications and Technology and the National Society for Performance and Instruction. The term message design was used in the literature frequently thereafter.

Research in diverse areas, such as cue summation, concept formation, animation, and attitude change, followed and contributed to a growing knowledge base. In 1991 West, Farmer and Wolff synthesized principles from the cognitive sciences especially as they related to frames or visual representation of content relationships. The second edition of Fleming and Levie's book appeared in 1993. It reflected advances in research and theory and included chapters which covered additional learning outcomes. The second edition also substituted a chapter on learning strategies for principles of memory learning. The second edition was well received (Allen, 1993); although the impact seems to have been less than with the first edition based on the number of reviews published.

Grabowski (1995) and Berry (1995) have written articles which trace the evolution of message design as an area of study and practice. Grabowski reviews major contributors to theory about message design and explains how the concept of mental processing or "inductive composition" has been added to the concept of planning for the physical form of the message. Berry describes the area of message design as becoming increasingly focused on circumscribed, specific messages, such as individual visuals, computer-based instruction sequences, and pages or screens. Thus, current research is directed more towards visuals and their processing than towards programs or speeches.

Although the concept of message design has been evolving since the 1960's, the first problem encountered while developing this conceptual structure was defining message design. Several questions about the nature and scope of message design arose:

What constitutes a message?
What does the message design process encompass?
What is the difference between instructional strategies and message design?

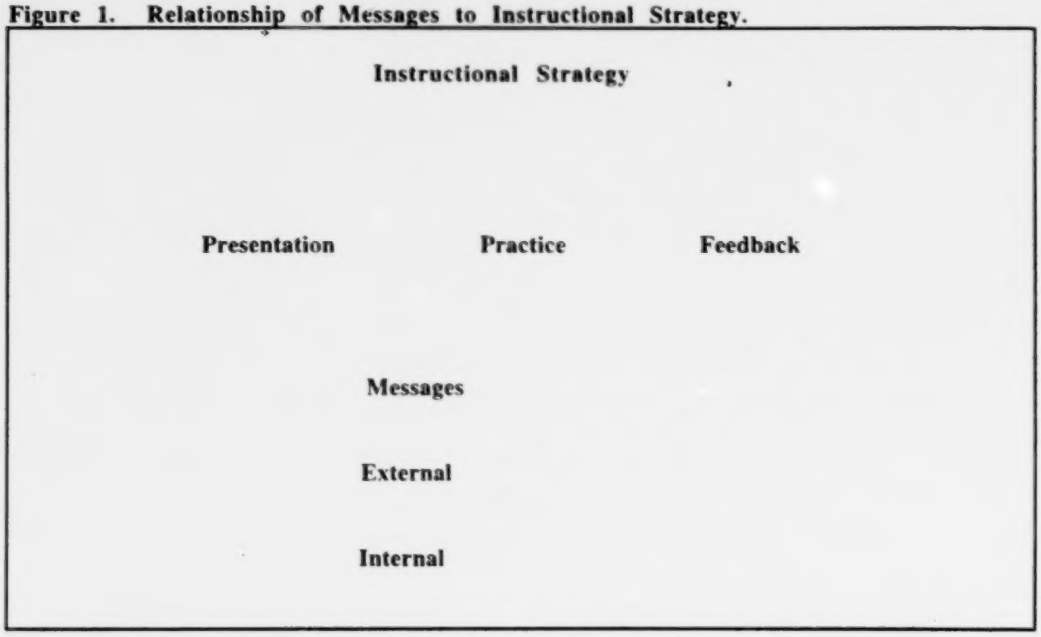
We will address each question and its resolution in order.

Both editions of the books by Fleming and Levie (1978, 1993) describe a message as "a pattern of signs (words, pictures, gestures) produced for the purpose of modifying the psychomotor, cognitive, or affective behavior of one or more persons (1978, p. x)." According to Grabowski (1995), external factors relate to message design for instruction and include dealing with attention, perception, and comprehension. Internal factors relate to message design for learning and include dealing with retention and retrieval.

What then is message design? The various definitions have in common planning for the form in which the message should appear. According to Seels and Richey (1994), "Message design encompasses principles of attention, perception, and retention that direct specifications for the physical form of the messages which are intended to communicate between a sender and a receiver (p. 31)." When message design is compared with instructional strategy design, it becomes clear that the construct "instructional strategy" differs from the construct "message design" by encompassing all the steps in

lesson design rather than just the ones related to presentations. "Instructional strategies are specifications for selecting and sequencing events and activities in a lesson"(Seels & Richey, 1994, p. 129)."

Figure 1. Relationship of Messages to Instructional Strategy.



We concluded that message design addresses only the presentation part of an instructional strategy and is focused on specifications for patterns of signs and symbols developed by a designer or learner. This definition puts the emphasis on one part of the instructional process, the external or internal form of a presentation. This relationship is illustrated in Figure 1. Notice that the presentation part of an instructional strategy can incorporate many messages.

This study needs to be interpreted using this definition:

Message design *is planning for the physical form of the presentation part of an instructional strategy and for the symbolic form in which a message is to be stored in memory.*

It was decided that this study would focus on developing a procedure for designing the presentation part of a message. Because the symbolic form for storage is under the control of the learner, it is not predetermined.

Figure 2. A Message Design Problem on Bicycle Safety

A unit on bicycle safety is being designed for second graders at all elementary schools in a suburban middle class district. The unit was prompted by the state's new helmet law for anyone riding a bicycle. It will be team taught by teachers from several subject areas including physical education, social studies, science. The teaching team is reviewing materials and approaches from many sources in order to determine the nature of the unit.

The objectives for the unit represent different types of goals: informative, attitudinal, conceptual, and psychomotor. The design team has decided that students need (a) knowledge, such as the safety equipment required, (b) attitudes, such as respecting safety laws, (c) concepts, such as procedures for safe operation of the bicycle, and (d) motor skills, such as braking and turning.

Thus, unit or lesson objectives could relate to:

identifying safety features on equipment
valuing wearing a helmet
obeying laws when operating a bicycle
demonstrating how to stop a bicycle when riding

Many other objectives could be derived from the goals of the teaching team. Some of the initial elements that the team has decided to incorporate in the unit are:

There will be a mock street environment created on the parking lot.
An existing computerized driver's test will be used.
A new computer program on the parts of a bicycle will be created.
An information booklet or handout for parents will be produced by second graders. This booklet will summarize the parent's responsibilities and the child's responsibilities and may include a contract.
An assembly program with a speaker's script and visuals will be incorporated.

The design team's research has revealed several useful sources of content, materials and activities.

The AAA (American Automobile Association) provides a brochure on bicycle safety laws and other materials.

The American Academy of Pediatrics has an injury prevention program called "tipp" that offers advise for parents including guidelines on bicycle use and maintenance. The "tipp" program also provides a bicycle driver's test for young riders that parents can administer.

A local Youth Cycle League offers to conduct safety awareness activities, such as assemblies, instructors, and bicycle activity days with mock driving tests.

The local police also offer these activities.

A national cycling association offers reprints from its magazine "Bicycle Forum." Reprints of articles from this magazine are available through a local cycling club called "The Wheelman." This local club has a monthly newsletter that stimulates interest in serious cycling, a telephone hotline of cycling news, and a web site for cycling enthusiasts.

Design an instructional message that will facilitate achievement of a lesson objective. Follow the procedure for theory-based message design.

The Research Process

The research process used was formative evaluation (Seels and Glasgow,1990; Flagg, 1990; Tessmer, 1993). The formative evaluation techniques differed depending on the phase of development and the stage of formative evaluation. In the beginning, focus groups of advanced instructional design students explored message design procedures and relationships using the traditional steps for the use of such groups (Stewart & Shamdasani, 1990).

The first focus group began by concentrating on how to evaluate the thoroughness of the message design process. The group recommended a checklist based on a design template presented in West, Farmer, and Wolff (1991). It proved too long and too broad to allow the designers to focus on the detail necessary in message design. The time spent on needs assessment, specification of objectives, and instructional strategy established a complete context for the message at the expense of time spent on planning and specifying details. This original checklist also incorporated reference to lists of principles on message design which overwhelmed the designer. Teams within the focus group tried out the procedure by designing messages for different types of learning. The solutions were then subjected to expert review and revision.

The next focus group addressed how to condense these variables The group recommended a one-page template to summarize factors such as context, constraints, learner characteristics, outcomes, content and media. Originally this template included both outcomes and types of learning. Eventually these were merged. The factor of paradigm considerations was included on the template but was developed as a separate step based on data from tryout. Based on recommendations for revision, the template became a design aid but was eventually disregarded as other design aids were created which replaced it.

Many worksheets were developed and discarded. After try-outs, such as using a long worksheet to develop a message to change attitudes, it became clear that they were impractical. Long worksheets overwhelmed the designer particularly when used before a few important decisions were made. This focus group also decided that motivation and perception were learning outcomes basic to all other types of learning. Thus, these were separated from other types of learning, and a procedure for designing for these outcomes was incorporated in the process.

One of the last steps in the research procedure was to develop a simulation exercise requiring application of the procedure to solving typical message design problems. Students in advanced instructional design classes used this exercise individually and in teams to practice the procedure while being observed by the developers who recorded difficulties with the procedure. A motivational message on wearing a helmet for safe cycling was designed using the procedure, piloted, and discussed. The bicycle example which proved so flexible and easy was used with variations for exercises and examples with different focus groups. An example of the bicycle exercise used in the tryouts is summarized in Figure 2. Individuals in these focus groups also submitted reaction forms and notes in margins of the exercise.

As the procedure was evolving, many forms for visualizing the related conceptual framework were considered including concentric circles and a scattergram. Eventually, decision trees in various forms including hierarchies were used to represent both the conceptual framework and procedure for message design. The process became more complex than decision trees could represent. Therefore, late in the research process it was decided that an oval diagram could be used to identify the interactions among variables. Some conventions from objective tree diagraming were combined with oval diagraming (Delp, Thesen, Motiwalla, & Seshadri,1977) to show how variables impinge on message design. From this basic visual, the final conceptual framework emerged.

The Conceptual Framework

Because there is little theory that suggests ways to interrelate variables, such as aesthetics, learning requirements and situational factors, most message design is done by developers using creativity and principles of systems design. Few designers are involved in message design based on learning or other principles. Instructional designers could prepare specifications for messages based on theory drawn from several areas of research if both conceptual and procedural theory were available. A proposed conceptual framework is shown in Figure 3. The major variables identified are learning types, parameters, paradigms, motivation, perception, and design principles. Although all these variables are interrelated, dotted lines are used to show those which have the closest relationships.

Figure 3. A Conceptual Framework for Message Design

See Appendix E of the *1996 AECT Proceedings*

A Theory-Based Procedure for Message Design

This procedure is intended for competent instructional designers or developers. It is not intended as a teaching tool. The results of formative evaluation indicate that it is an effective procedure for practioners because it disciplines them to be systematic and cues them to attend to variables in specific ways.

Figure 4. A Flowchart of the Theory-Based Procedure

See Appendix E of the *1996 AECT Proceedings*

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This procedure requires using a series of design aids which suggest principles that may be important to your message. None of these design aids offers all the principles in an area. You can also consider principles you know are important or consult sources. The design aids serve to cue your attention to areas.

As the framework shows, the order in which you address the major variables can vary; however the procedure given recommends an order that the research revealed was generally most effective. This order is given in Figure 4. Notice that the first step is to describe the purpose for the message and the creative idea under consideration. The final product is the Message Design Worksheet which summarizes the design plan. An example of this final product is given in Table 1.

There are six design aids incorporated in the procedure. Each highlights some of the principles that need to be taken into account when designing for different types of learning. Identify the type of learning (retention/recall, concept learning, problem solving, attitudes, or motor skills) that your message will facilitate. **The first time through the procedure it is best to work with only one type of learning and one principle from each design aid.** After one is familiar with the process, it becomes easier to work with more than one principle, parameter, or type of learning. The design aid for types of learning is given in Table 2.

The principles represent the key questions relevant to each learning outcome. A designer could consult more complete compendiums of guidelines and principles specific to these types of learning.

Table 1. Example of a Completed Message Design Worksheet

Variable	Principle
Purpose/Idea	Second-grade students will value wearing a helmet when riding a bike. A videotaped presentation comparing the consequences of accidents with and without a helmet will be produced and used as part of an assembly.
Type of Learning	**Attitude Change:** Use sources that the learner can identify with and will consider credible. Members of the local Youth Cycle League will be asked to narrate the videotape and present it at the assembly.
Parameters of Message	**Age and Maturity:** Students at this age can frighten easily. It is important to emphasize serious consequences without raising anxiety to a level of defensiveness. Do this by offering helmet as a way to avoid consequences and procedures as a way to avoid accidents. **Channel:** This will be a group presentation. The average student usually learns best from an effective combination of audio and visual. Since this is attitudinal learning, it is not necessary to have physical practice. **Media:** Video sequences using narration. **Content:** Use an analogy of Humpty Dumpty situation or egg falling if not packaged. Show symbols of where law made and who enforces law. Include fashionable as well as out-of-date bikes and helmets. Talk about peer pressure.
Learning Paradigm	**Cognitive Science:** Script for assembly should include mental rehearsal of visual image of wearing helmet when riding. Guided fantasy or imagine putting on your helmet. What kind of helmet is it, etc. Include some non-examples in video and ask audience is he/she ready. Why not? Who's not dressed properly for riding?

Table 1. (continued)

Principles of Motivation	**Build Confidence:** In the videotape and the script for assembly give them a challenge that they can meet. Talk about what to look for when buying a helmet, how to get one if parents can't afford one now, and what to do until have helmet.
Principles of Perception	**Plan for Preattentive Perception Processing:** Start videotape presentation by explaining the safe bicycle riding depends on things that must work together including the rider and how he/she is dressed (with helmet), the bike and its safety equipment, and the rider's attitude and knowledge.
Design Principles	**Visual Design:** Focus attention through color, e.g. wild helmet, and use color in clothing to create character.
Description of Design: A videotape presentation for a scripted assembly will be narrated by a member of the Youth Cycle Club. The assembly will be hosted by a member of this club. The videotape will begin by explaining that safe riding depends on things that must work together including the rider's attitude, knowledge, attire, the bike's equipment, and the parent's rules. Color will be used to highlight, enliven, and make scenes realistic. Analogies of Humpty Dumpty and eggs packaged and unpackaged will be given. Pictures of the state capitol and police will be included. Fashionable and old bikes and helmets will be included. The topic of peer pressure will be discussed. Another topic will be how to tell parents about buying a helmet and what to do if parents don't have the money now. While the videotape is showing, students will be asked to yell out if characters are improperly attired. The tape will end by offering the helmet as a way to avoid the consequences of accidents. After the tape, the host or hostess (opposite sex from narrator) should bring students up and put helmets on some in line up and ask students to yell out when standing behind one who is guilty of not obeying the law. Then, the students should be lead in mentally rehearsing imagining putting on helmet and going on a guided fantasy ride.	

The second design aid summarizes parameters that may influence the design. This aid is given in Table 3. This aid cues consideration of learner characteristics, and channel, media, and content requirements.

The Learner Characteristics column suggests some factors that can affect other parameters. For example, learning style can indicate channel requirements (Smith & Ragan, 1993), or ability and attitude can indicate content parameters.

The Channel Recommendations column cues the designer to identify the means of sensory input. This step is important because it limits what media can be used and how media are used. A decision to use the visual channel only means that if a continuous visual presentation is used, such as video, it will be used without a soundtrack, which is an acceptable though seldom used way to design video sequences.

The Media Recommendations column prompts reaffirmation of media design decisions. This decision should be reconsidered in light of learner, channel, and content requirements. Integrated technologies includes the option of using people, for example, to deliver a speech. There seemed to be no place for people in this procedure. Yet, people are demonstrably the best way to communicate. Because people usually employ several channels and media when they deliver a message, this option has been placed with integrated technologies.

The Content Recommendations column reminds you that messages are based on symbolic language in both visual and verbal form. Therefore, important decisions must be made about what signs and symbols to use and what examples and topics will serve as vehicles. It is usually best to incorporate at least fifty percent familiar content as well as some novelty for motivation and challenge. The more anxious the learner, or the lower in ability the learner, the more important it is to use familiar imagery and language. Analogies and metaphors can be used to convey meaning.

Sometimes there are reasons why a designer wants instruction to be consistent with a learning paradigm. On the other hand, the designer may feel that in practice, the best strategy should be used regardless of paradigm consistency. In practice, some of the strategies, such as chunking and case study, are used historically by more than one paradigm. In many cases, followers of one paradigm do not agree with the narrowness of their philosophy as described by followers of

another paradigm. Nevertheless, whether one paradigm is to be used consistently or elements of several paradigms combined rationally, it is reasonable to consider how a paradigm applies to the design you are planning. This design aid can reveal inconsistencies that should be eliminated. Table 4. is the Design Aid on Learning Paradigms.

Table 2. Design Aid for Types of Learning

Type of Learning	Principle	Example
Recall/Retention	Make associations meaningful	Use meaning as a basis for organization or grouping
	Repeated exposure to stimuli enhances retention	Use varied repetition
	Provide memory cues	Use imagery and mnemonics
Concept Learning	Carefully select examples	Use a wide variety
	Sequence rationally	Use simple to complex or superordinate
	Confirm concept learning	Have students identify or use concepts
Problem Solving	Facilitate acquisition of information	Emphasize through adjunct questions and highlighting techniques
	Provide guidance in structuring the problem	Demonstrate translating the problem into sentences or drawings
	Facilitate learning how to separate relevant and irrelevant information	Provide practice in selecting information from cues and directions
Attitude Change	Influence persuasiveness through choice of sources	Use sources that the learner can identify with and with enough information, experience, and intelligence to be considered credible
	Establish belief congruence	Argue in favor of a position the learner holds so that effectiveness is increased when presenting an argument in another area
	Provide balanced arguments that relate to the learner's needs	Create and manage dissonance; show how needs can be satisfied by adoption; recognize current attitudes and move in small steps towards the desired attitude; state the conclusion explicitly

Motor Skills	Cue mental practice Match presentation format to type of task Sequence appropriately for task characteristics	Cue steps in procedure Use observation of model performance for simple tasks incorporating known skills Use the whole-task approach for integrated and coordinated activities

Because motivation is basic to all other types of learning, every instructional message should incorporate principles of motivation. These design aids summarize the most important questions to consider. They are meant to be used with more extensive references in the literature on principles of motivation and on tactics for implementing these principles. For example, McAleese and Gunn (1994) list tactics for developing confidence (expectancy) as providing tests of performance, feedback, praise, advisement, and knowledge of results. Table 5 is the aid for motivation.

Table 3. Design Aid for Parameters of Message

Learner Characteristics	Channel Recommendations	Media Recommendations	Content Recommendations
Demographic, e.g. age, maturity, socio-economic background, geographic region, etc. Learning style, e.g. visual/auditory, sensory/intuitive, inductive/deductive active/reflective, sequential/global Ability and attitude e.g. high or low, anxious, enthusiastic	Audio Visual Audiovisual Kinesthetic Tactile Olfactory	Print technologies, e.g. frame, page Audiovisual technologies, e.g. shot, sequence Computer-based technologies, e.g. graphic, screen, sequence Integrated technologies, e.g. sequence, people	Sources of imagery e.g. cultural, professional Signs Symbols Examples Topics

Table 4. Design Aid for Paradigms

	Behaviorism	Cognitive Science	Constructivism
Paradigm Assumptions	performance oriented	domain oriented	problem context oriented
	know reality	construct schemata	construct reality
	designer perspective	designer and learner perspective	multiple perspectives
	mathemagenic strategies	mathemagenic strategies	generative strategies
	acquire knowledge		socially constructed meaning
Micro Strategies	contiguity reinforcement cuing feedback minimize errors	chunking frames mapping advance organizer rehearsal mnemonics outlining metaphor/analogy visuals	argument discussion debate reflection exploration interpretation construction use misconception
Symbols	direct attention	cue memory	tools for constructing reality
	external representation of reality	external and internal representation of reality	internal representation of reality

If learners do not attend the message, then communication and learning will not occur. Like motivation, perception is basic to all types of learning. Use the Design Aid on Perception Principles to ensure that the audience receives what is intended. It is assumed that the designer could at this point consult more complete compendiums of principles specific to types of learning, such as perception. Table 6 is the aid for perception.

There are instructional and aesthetic principles of design that come from media areas such as graphic design, visual communication, information design, screen design, and text design. These principles can be used to solve problems that are not unique to a type of learning, such as how to use space and how to organize symbols. Only a few of the many sources are suggested on the design aid. Use the principles offered to critically evaluate the design for the message; then, revise the design as suggested by the principles. Start by identifying a column (screen, text, information, or visual design) that relates to the message you are developing. Table 7 presents the aid for general design principles.

The last step in the procedure is to summarize a design plan based on the principles identified on the Message Design Worksheet. The form for this worksheet is presented in Table 1 which was presented earlier in this article. After summarizing the principles and parameters selected, a paragraph is written describing the creative approach to design and the theory exemplified by the design.

Table 5. Design Aid for Principles of Motivation

Type of Learning	Principle	Example
Motivation	Stimulate learner's attention and curiosity	Use variation in organization and presentation; provoke mental conflict
	Create a clear relationship between objectives and learner goals	Use analogies, metaphors, and personal language to build a relationship between content and objectives and learners' need and desires
	Build confidence to produce appropriate expectancy for success	Design appropriate challenge level
	Gain and maintain learner's attention	Make the presentation appealing by using print, writing style, graphics, formatting and images

Table 6. Design Aid for Principles of Perception

Type of Learning	Principle	Example
Perception	Plan for preattentive perceptual processing	Organize information using clear boundaries, clear figure-ground distinctions and clear units or parts
	Select and organize information to assist in attentive perceptual processing	Sequence information appropriately (top-bottom, left-right for English readers)
	Plan for learner interpretation	Consider learner characteristics, such as cognitive abilities, e.g. skills
	Structure visual perception	Provide good figures which are complete, balanced, and perceived as integrated rather then separate elements; group by proximity, similarity, common movement

This design plan should be reviewed by colleagues and representative learners and adjusted as recommended. After completing this theory-based procedure, the next phase, developing or producing the message starts. Changes in the message design concept can occur at this next stage also.

Discussion

Performance support systems take many forms at different levels of sophistication including calculators, word processors, workstations and just-in-time training on demand. This conceptual framework and procedure was conceived as a basis for interactive on-the-job training technology that would support message design activities. The database necessary for message design is so extensive that an "if-then" performance support system would be the ideal. This electronic performance support system could have as one of its components a decision making model based on this theory-based procedure.

This performance support system could also include an expert system to present an ideal approach to decision making, text retrieval to make references conveniently available and searchable, a data base to provide access to principles and guidelines, a browser to extend access to sources of information, and a neural network system to connect key words in the knowledge domain. Obviously, this proposed theory does not provide the interface or elements to develop such a system. Nevertheless, it is a start towards conceptualizing a performance support system that could accept input and adapt, provide multiple modes of access to information, and offer both practice activities and activities which require organizing knowledge. Task support worksheets could be supplemented by cue cards, wizards, coaching, explanations, checklists, tips, decision trees, decision making models, and process maps. The user could study through computer-based instructional sequences, look up information through on-line reference systems in hypertext, and ask advise of an intelligent expert system. Roles for experts and novices could be programed including roles for designers, writers, producers, artists, programers, and managers.

What form will the adaptation of technology for message design functions take? Will expert systems lead designers through the process or replace the designer? In the future will message design be done by machines or a man-machine system? Properly designed systems could allow non-experts to produce results similar to an expert. This would be done by the expert system querying the user to gain data about the situation. This data would then be processed by the system following built-in rules.

The process of message design becomes far less daunting when a database holds all the worksheets and checklists to be used. Once part of that database, the items that apply to the current design can be selected and created as working documents through screens committing the result to paper. Performing any job well calls for the consistent application of a set of rules or procedures. We all omit a step from time to time, but the computer never skips a step. Once properly programed the computer is capable of replicating results time after time. A debatable issue, however, is whether such a computerized support system would eliminate the creativity that distinguishes many superior messages.

One advantage of such systems could be the ability to manage the minutia of many design projects. Many designers are imaginative but uninterested in details. Turning the details of a project over to an electronic assistant frees the designer to be creative without losing control of the details. The computer could ensure full coverage of all the necessary steps in the process of message design presented by this conceptual structure.

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